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CENTRAL INTELLIGENCE AGENCY

29 March 1956

SUBJECT: TERMS OF REFERENCE: NIE 11-6-56: CAPABILITIES AND TRENDS
OF SOVIET SCIENCE AND
TECHNOLOGY

THE PROBLEM

To assess current capabilities and trends in Soviet science and technology and to estimate future potential in this field.

SCOPE

This is the first national estimate devoted exclusively to Soviet science and technology. It provides an opportunity to make an over-all evaluation of the Soviet scientific and technical effort, as well as to discuss in greater detail the factors which have been considered in making the rather general statements in NIE 11-4-56.

It is not considered necessary to include the detailed material already contained in estimates which cover specific areas such as nuclear weapons or guided missiles. Therefore, only a general evaluation of research capabilities is required in Part IV together with examples of achievements where appropriate.

This material contains information affecting the national defense of the United States within the meaning of the espionage laws, Title 18, USC, Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

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In the short time that is available, it is not expected that complete and satisfactory answers will be found to some of the problems which will arise in making this estimate. The preparation of this estimate should serve, however, to pinpoint those areas where information is insufficient to make a sound evaluation. If this estimate is repeated in a year or two, it is hoped that activity within the intelligence community in the intervening period will help to fill those gaps.

QUESTIONS BEARING ON THE PROBLEM

I. National Policy and Goals Related to Science and Technology

- A. What is the governmental attitude and national policy toward science? What are the announced aims and the long-term goals of the Soviet scientific effort? What factors are involved in assigning priorities to various aspects of the research and development program?

II. Scientific and Technical Resources

- A. How is scientific research and development organized and controlled? What are the long-term trends in the organization of science in the Soviet Union?
- B. What is the present level of expenditure on research and development? What is relation to gross national product (GNP)? Compare with other countries. What are the trends in expenditures on research and development?

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- C. Discuss the distribution of Soviet scientific research and development effort: (1) as between basic and applied research, and (2) as between military, basic industrial, and consumer needs. How are their scientific capabilities affected by Soviet economic and political systems?
- D. What is present scientific and technical manpower strength and how is it distributed? What are the trends through 1961? Compare with corresponding US figures.
- E. Discuss briefly the quality of scientific and technical manpower. What are outstanding strengths? Weaknesses? What are the incentives as well as deterrents affecting scientific output?
- F. Describe scientific education and training in the Soviet Union including numbers and type of institutions at various levels. Compare quality of graduates with US where possible. Indicate trends in emphasis of scientific and technical training.
- G. What facilities are provided for conducting research and development? Are the facilities adequate for present programs? What are the limiting factors in expansion of research and

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development facilities? To what extent are the Soviets dependent on Satellite and Western sources for scientific equipment and instruments?

H. To what extent and in what ways does the USSR utilize Satellite and Chinese Communist scientific resources? To what extent is the Soviet Union able to render scientific and technical assistance to the Satellites and Communist China?

I. What advantages would Soviet science derive from expanding international exchanges and contacts? What contribution does Western science make to Soviet capabilities?

III. Soviet Capabilities in the Basic Sciences

A. Discuss present Soviet capabilities in the following fields of basic science indicating strengths and weaknesses. Significant additional fields may be added. Give examples of important advances where appropriate. Discuss long-term trends (about 5 to 10 years). Indicate areas where major advances or breakthroughs might occur.

1. Physics
2. Nuclear physics
3. Mathematics
4. Chemistry

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5. Metallurgy
6. Biology
7. Medicine
8. Agricultural sciences
9. Geophysics
10. Electronics
11. Communications theory
12. Radio astronomy

IV. Soviet Capabilities in Research and Development Related to
Military and Industrial Technology

- A. Evaluate present Soviet capabilities in the following
fields, giving examples of outstanding recent developments.
Indicate probable future trends.

1. Atomic energy, including weapons, power, and propulsion
2. Guided missiles systems
3. Artificial satellites
4. Aircraft and related weapon systems
5. Ground force weapon systems
6. Electronics and communications
7. Naval weapon systems
8. Chemical and biological warfare
9. Technology related to development of natural resources,
e.g., exploration, prospecting, mining, forestry.

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10. Technology related to basic industries, e.g., iron, steel, non-ferrous metals, power, agriculture
11. Technology related to improving productivity or efficiency, e.g., mechanization, automation.

B. Discuss significant factors affecting the time between the development and production of new weapons, in the introduction of new industrial processes or products, or any other application of research. Compare with the US or other advanced nations where appropriate.

V. Overall Effectiveness of the Scientific Effort

- A. How effective is the USSR in utilizing the results of scientific research and development, broadening the scientific base, developing equipments and extending science into areas not now considered feasible?

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